ABSTRACT

Two images are analyzed to compute a set of motion vectors that describes motion between the first and second images. A motion vector is computed for each pixel in an image at a time between the first and second images. This set of motion vectors may be defined at any time between the first and second images, such as the midpoint. The motion vectors may be computed using any of several techniques. An example technique is based on the constant brightness constraint, also referred to as optical flow. Each vector is specified at a pixel center in an image defined at the time between the first and second images. The vectors may point to points in the first and second images that are not on pixel centers. The motion vectors are used to warp the first and second images to a point in time of an output image between the first and second images using a factor that represents the time between the first and second image at which the output image occurs. The warped images are then blended using this factor to obtain the output image at the desired point in time between the first and second images. The point in time at which the output image occurs may be different from the time at which the motion vectors are determined. The same motion vectors may be used to determine two or more output images at different times between the first and second images. The images may be warped using a technique in which many small triangles are defined in an image corresponding in time to the point in time between the first and second images at which the motion vectors are determined. A transform for each small triangle from the point in time at which the motion vectors are determined to the desired interpolated image time is determined, e.g., the triangle is warped using the motion vectors associated with its vertices. For each pixel in each triangle in the output image, corresponding points in the first and second images are determined, and the first and second images are spatially sampled at these points. These samples for each pixel are combined to produce a value for that pixel in the output image.